

**Co+living Design: Participatory design simulation gamification for life-enhancing built environments in age-appropriate, inclusive and multi-generational co-living buildings without limitation**

Ottmann, Daniela Angela

*Published in:*  
Pixo: Journal on Architecture, City and Contemporaneity

*DOI:*  
[10.15210/PIXO.V4I14.19883](https://doi.org/10.15210/PIXO.V4I14.19883)

*Licence:*  
CC BY-NC-ND

[Link to output in Bond University research repository.](#)

*Recommended citation(APA):*  
Ottmann, D. A. (2020). Co+living Design: Participatory design simulation gamification for life-enhancing built environments in age-appropriate, inclusive and multi-generational co-living buildings without limitation. *Pixo: Journal on Architecture, City and Contemporaneity*, 4(14), 16-29. <https://doi.org/10.15210/PIXO.V4I14.19883>

**General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

For more information, or if you believe that this document breaches copyright, please contact the Bond University research repository coordinator.

# CO+LIVING DESIGN

## Participatory design simulation gamification for life-enhancing built environments in age-appropriate, inclusive and multi-generational co-living buildings without limitations

*Daniela A. Ottmann*<sup>1</sup>

### Abstract

This article reports on conducted research on co-design for multi-generational co-living architecture and development proposals for urban living as solution to deal with ageing populations that are spatially disconnected like in the Metropolitan Region Perth/Western Australia. A gamified scenario simulation, the 'Co-living<sup>2</sup> game', has been invented to explore uses of spatial activity, ambience and features of individuals anticipating to live together in a specific urban setting. The aim was to enable potential inhabitants to explore and to adjust their needs and desires within a potential future built environment, using their contemplated daily activity patterns and qualitative considerations of common areas, which transfer easily into the design process of a masterplan for Co-housing<sup>3</sup> settlements. The results of the simulation survey includes the evaluation of programming priorities and concepts for the further urban and architectural development of Co-housing communities that enable age-appropriate, inclusive, multi-generational co-living buildings without limitations.

Keywords: participatory architecture, collaborative research, sustainable urban development.

# CO+LIVING DESIGN

## Gamificação participativa de simulação de projeto para ambientes construídos para ambientes construídos adaptados a idade e que melhorem a vida, e construções compartilhadas, inclusivas e multi-geracionais sem limitações

### Resumo

Este artigo relata pesquisas conduzidas sobre co-design de arquitetura de co-vida multigeracional e propostas de desenvolvimento para a vida urbana como solução para lidar com o envelhecimento de populações espacialmente desconectadas como na Região Metropolitana de Perth/Austrália Ocidental. Uma simulação de cenário gamificado, o 'jogo de convivência', foi inventada para explorar o uso de atividade

espacial, ambiente e características de indivíduos que esperam viver juntos em um ambiente urbano específico. O objetivo era permitir que os habitantes em potencial explorassem e ajustassem suas necessidades e desejos em um ambiente potencialmente construído no futuro, usando seus padrões de atividades diárias contempladas e considerações qualitativas de áreas comuns, que se transferem facilmente para o processo de projeto de um plano mestre para co-habitação. Os resultados da pesquisa de simulação incluem a avaliação de prioridades e conceitos de programação para o desenvolvimento urbano e arquitetônico das comunidades de co-habitação, que permitem edifícios co-vivos apropriados para a idade, inclusivos e multigeracionais, sem limitações.

Palavras-chave: arquitetura participativa, pesquisa colaborativa, desenvolvimento urbano sustentável.

### Introduction

The 'Co-Living Game' is a simulation game that explores uses of spatial activity, ambience and features of individuals anticipating to live together in a specific urban setting. The aim is to enable users to adjust their needs and desires within the future built environment, using their contemplated daily activity patterns and qualitative considerations of common areas, which transfer easily into the design process of a masterplan for Co-housing.

The Co+ Living Design research approach is utilised to conceptualise and design a demonstration project that showcases affordable housing in modular building technology for seniors. The research and development phases (2015-2018) have resulted in the following government reports:

- Co+1: 'Co-living Design tool Kit' A tool-set for age-appropriate housing design parameters for Housing | Department of Communities (DCCO) | Government of Western Australia;
- Co+2: 'Co-living Community Forums' Community engagement workshops to co-design, showcase and to promote the developed modular housing prototypes (H+) within the Urban Living Strategy for Housing | Department of Communities (DCCO);
- Co+3: 'H+ Co-living dwelling complex' Urban living in age-appropriate communities (program, diagrams, models and plans for a case study area based on discussions with DCCO).

This project will apply previous research of the AUDRC on Affordable Housing, Modular Building Systems, Community Participation, and Housing Identity for Housing | Department of Communities (DCCO) | Government of Western Australia:

- H+ 'Modular Housing System': An investigation into a serial housing module system for individual and multi-residential urban living (2015);
- C+ 'My future home'. This report contains the approach, design and result of the interactive demonstration 'My future home' community charrette, held at the B-Shed/ Fremantle Ports, with the City of Fremantle, Housing Authority, AUDRC, and further contributions by the Department of Water, the Water Corporation, and Landcorp (2016).

<sup>1</sup> Abedian School of Architecture, Faculty of Society and Design, Bond University, Gold Coast, QLD Australia 4229, Centre for Comparative Construction Research, Bond University, Gold Coast, QLD Australia 4229.

<sup>2</sup> Definition Co-living: The term 'Co-' is used here as an abbreviation of cooperative (from Latin 'cooperativus' worked together).

<sup>3</sup> Definition Co-housing: This term is used in this article to describe various forms of co-living: shared apartments and units (e.g. elderly living community) and multi-residential and/or multi-use settlements (e.g. shared common spaces).

## Ageing population and affordable housing: A quest for participatory design and planning

The Australian population is ageing, with older Australians a growing proportion of the total population. In 2017, 15% of Australians (3.8 million) were aged 65 and over; this proportion is projected to grow steadily over the coming decades. 'Like many developed countries, Australia has a high median age: a relatively large proportion of its population is aged 65 and over. In 2015, the median age in Australia was 37.2. In 2020, the proportion of people aged 65 and over are estimated to increase by around 1.2% for Australia (Australian Institute of Health and Welfare, 2018).

Due to the car focus in the planning attempts of many Australian cities, the urban tissue consists of mono-use fragments resulting in a low-density, horizontal urban sprawl. Many residential developments attracted people to buy-in in the same life phase. This mono-demographics bracket results in residential precincts growing old together without demographic diversification. However, the connection to infrastructure services and walkability of those neighbourhoods is difficult for older people.

De-connectedness triggers social-isolation and loneliness of people in their low-density residencies where they are missing a socio-cultural community. Many older people are looking for homes that are well-located near friends, family, amenities and transport.

According to Ong (2019) on the socio-economical grounds with the growing number of older people, rising living costs and mostly low fixed incomes, pensioners are facing a ever-increasing mortgage debt. Between 1987 and 2015, mortgage debt among older mortgagors increased by 600 per cent (from \$27,000 to over \$185,000). These trends have significant consequences for older Australians' wellbeing, retirement wealth management and government incomes policy and housing assistance programs.

More people are facing a housing crisis with a high rate of invisible homelessness among older people. At the same time, the affordability of a diverse palette of housing options barely exists. Resulting from those observations of various challenges to enable ageing with choice in the metropolitan area of Perth, Australia, this research scope investigates solutions for housing enabling programmatic, demographic, socio-cultural, and socio-economic diversity.

To design with people for people, the 'Co-living Game' was invented as a survey evaluation tool leading into a cooperative planning and design approach.

Here the participatory ideation and conceptualisation enabled via the 'Co-living Game' attempts solutions for multi-generational co-living proposals (across ages and without limitations to bodily, mentally and economic restrictions). The desires of the inhabitant and the design proposals for multi-generational co-living models are synchronised. Here the user's needs can integrate better into an ongoing design process. Besides, the emphasised haptic qualities of the produced game scenarios engage the user with the more physical and intuitive aspects of the design. The game is composed to engage the individual players with their needs and opens opportunities of steering overlapping communal aspects of co-housing programming in a game-like scenario planning. Beyond this, the game sets can further be used for stakeholder negotiation methods with housing inhabitants post-occupancy or in any other creative problem-solving context that requires community consensus during operation and maintenance phases.

## The gamified approach: Designing places for people with people

### Methodology

This research sits within the broad church of collaborative research. Facer and Pahl (2017), situate collaborative research within a theory of change, wherein engaging with communities or affected publics leads to the creation of 'legacies' of new imaginations (p5). As a 'design and innovation' typology (p. 16), this research engages community/public at a very early stage towards the creation of new imaginations. In inviting participants to 'play a game' this research brings together a process of mapping overlaid with preferences in spatial features, activities and ambience of life cycles at various user scales to plan for co-housing concepts. Herein, 'playing the game' generates new ways of knowing, "through doing things together" (Facer and Pahl, 2017, p. 216). Another aspect of collaborative research methodology that is reflected in this research is the belief that knowledge is constructed with individuals in a side-by-side positioning, thereby inviting "rich dialogue between and among individuals and the multiple perspectives they represent." (Given 2008, p. 92) Sanoff (2016) notes that successful design is based on a "clear understanding of people's objectives" (p. 1) brought forth through a negotiated process. Here the environment under consideration is flexed to accommodate the needs and desires of a particular group of people. (p. 2).

### Methods

One chosen method for this research was 'playing a game'. According to Sanoff (2016) a game "includes any situation in which something is gained as a result of a proper choice strategy" (p.167). This method brings together individuals to 'engage with group processes have the unique advantage of facilitating learning through the transfer of expertise between participants. (p.7) At the same time bringing a new housing typology and organisation to an environment that does not have demonstration projects like the proposed one yet. A semi-open survey combined with social mapping and innovation thinking methods has been applied to bridge predictable answers and unpredictable new ones with regards to co-housing as shared housing typologies. Semi-open methodology (abductive method) whereby the to be researched subject (co-housing



Figure 1 - Co-living game in action. Source: author.



Figure 2 - Co-living game collage (results). Source: author.



built environments) is to be explored with a group of non-planning/design-related participants, which compile the supposed user

#### Goal of the Simulation Game as a method

The main research question was to simulate with people (to whom the concept of co-housing might be a new one) a co-living community through allocating spatial programming to different private, semi-public and public realms of a daily life within an unknown or known group of people sharing a village like settlement estate. Within a game-like scenario, an agreement and allocation of spatial features, the indication of daily activities and spatial ambience preference reflections with regards to privacy and public realm are spatially negotiated. For this, a gamified simulation, the 'Co-living game', has been invented to explore uses of spatial activity, ambience and features of individuals anticipating to live together in a specific urban setting.

The fundamental questions that are answered through the simulation game method are:

- What Activities are happening in private, semi-public, and public?
- What Ambiance descriptions are preferred?
- What shared features are preferred?
- Where and When are people interested in sharing and negotiating semi-public and public domain.

The set up for the community charrette (see one example in Fig.1) conducted from September-November 2017 aims to co-design, organise and facilitate community engagement workshops that will showcase and promote the developed modular housing prototypes within age-appropriate housing prerequisites and the validation of previous research (Housing+ 2015, and 'My future home' 2016) through feed-back from different groups. The target groups include but are not limited to elderly, impaired, younger, mixed inter-generational living, senior living, homeless, carers).

#### Participants

Seniors with other diverse demographic groups contribute to a vibrant and liveable community (Seniors, Youth, Mobility Impaired, Carers). Subsequent simulation games forums were held in different demographic structures are described. The desires of the user and the concrete ideas of co-living models are synchronised, for the user's needs to integrate better into the ongoing design process with a group of different user groups. In addition, the emphasised haptic qualities of the produced game scenarios engage the user with the more physical and intuitive aspects of the design. The game is composed to engage the individual players with their needs and opens opportunities of steering overlapping communal aspects of co-housing programming in a game like a scenario planning. The game sets can also be used for stakeholder negotiation methods with housing inhabitants or in any other creative problem-solving context that requires community consensus.

#### Data Output

Individual and communal game sets result in data for each game board (4 players) and the combination of board collages (see Fig.2) into a 'village' (e.g. 24 players... 6 boards). Through highlighting group data, shared preferences, and further discussion comments on co-living aspects, an overall analysis of the findings can further inform

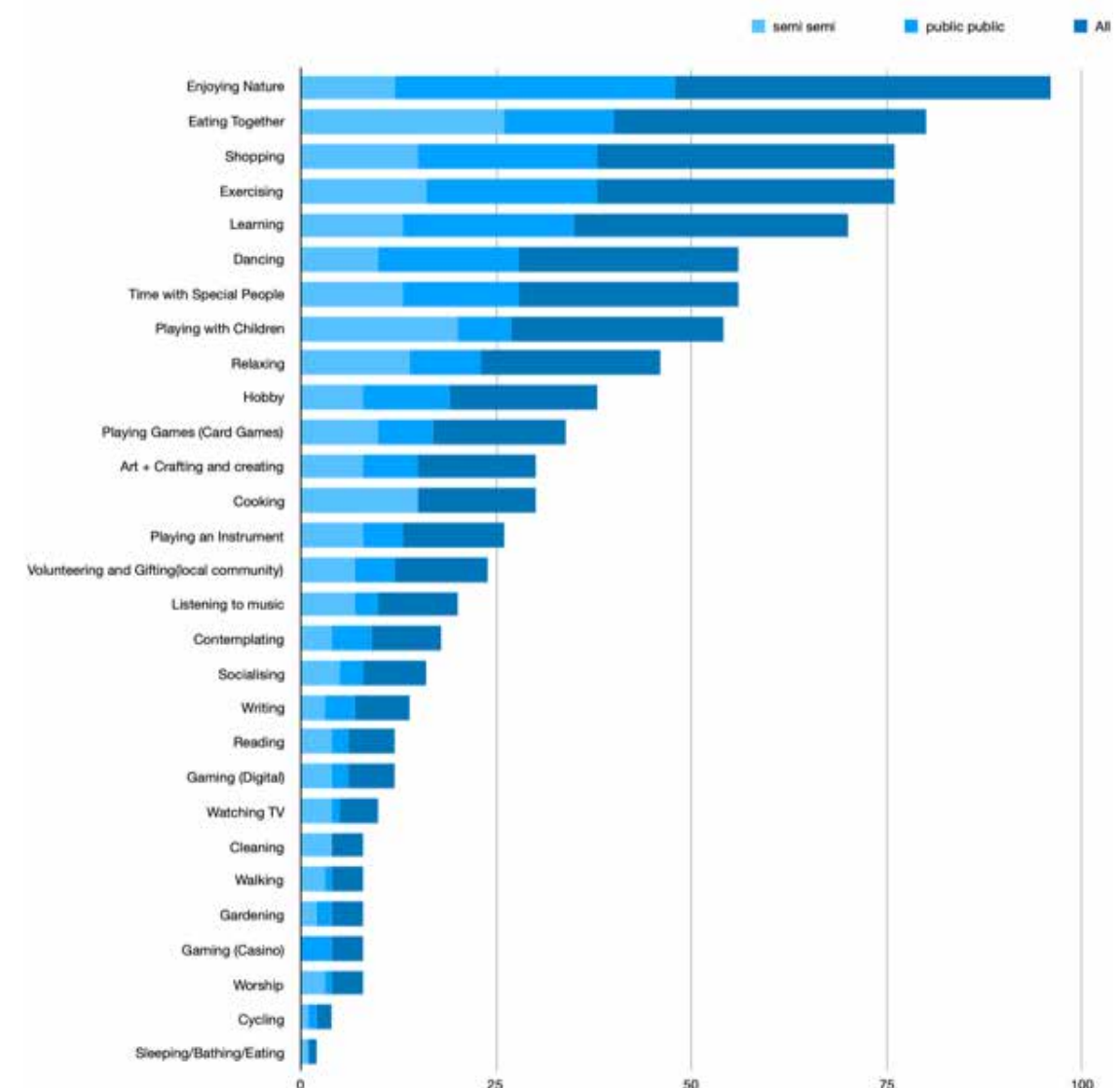
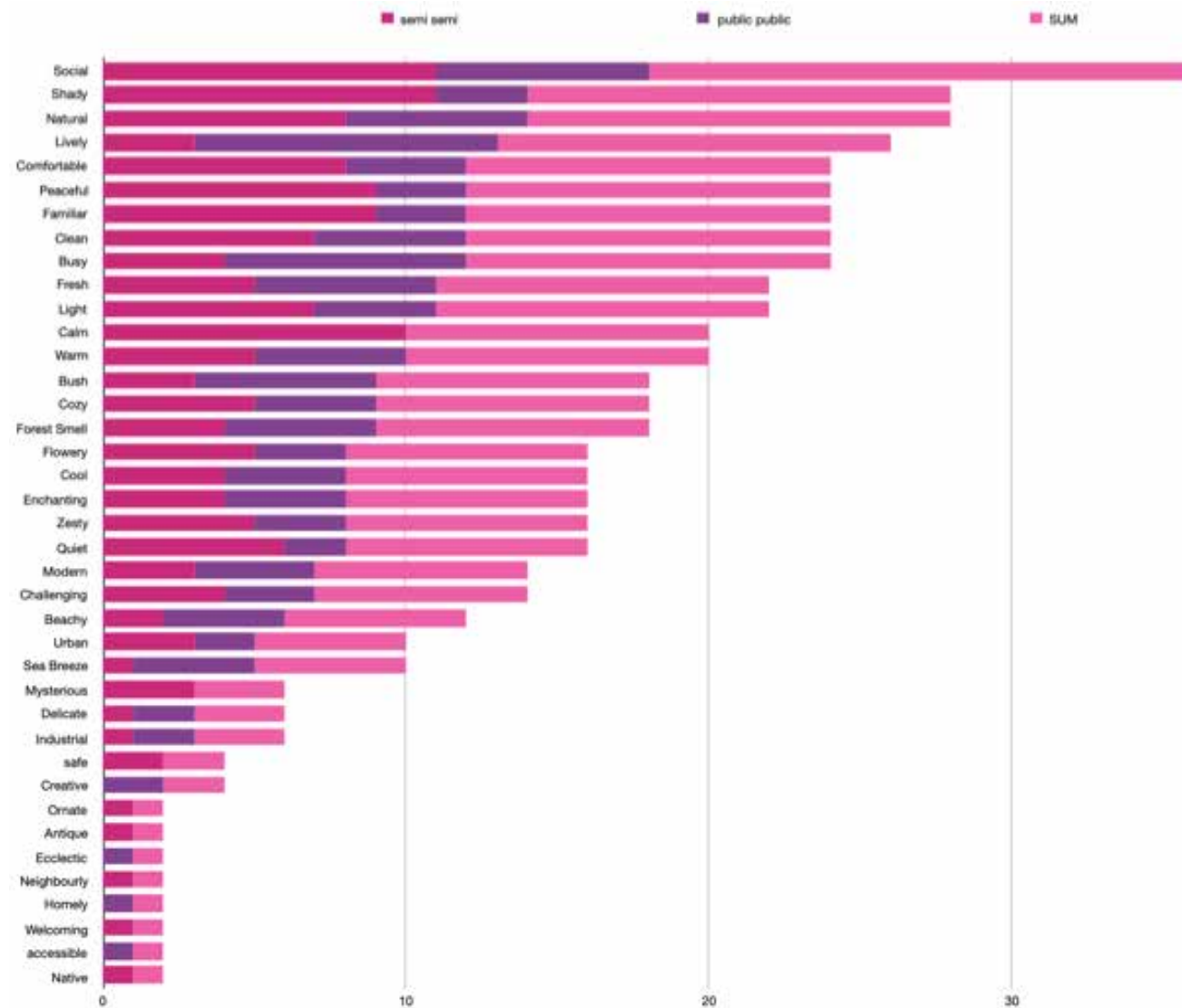


Figure 3 - Co-living game results (activities). Source: author.

Figure 4 - Co-living game results (ambiance). Source: author.



simulation models. Results reveal the relation of how shared domain is anticipated in terms of feature, community involvement and spatial qualities within a group of four as fractal within the broader 'village' groups. In over 21 games (data from 84 participants and 21 shared facilities scenarios) that have been played in the research period from September to November 2017 the outcome scenarios have been named and a stimulating title has been found for each Co-living community. The game is composed to engage the individual players with their needs and opens opportunities of steering overlapping communal aspects of co-housing programming in a game-like scenario planning.

In a repeated measures design, several community charrettes with the 'Co-living game' as a design simulation framework were conducted in 2017. Those were aimed to co-design, organise and facilitate community engagement workshops that showcase and promote the developed modular housing prototypes within age-appropriate housing prerequisites and the validation of previous research (Housing+ 2015, and 'My future home' 2016) through feedback from different groups. The target groups included but were not limited to elderly, impaired, younger, mixed intergenerational living, senior living, homeless, and carers.

## Results and Discussion

What Activities are happening in private, semi-public, and public? (Fig.3).

What Ambiance descriptions are preferred? (Fig.4).

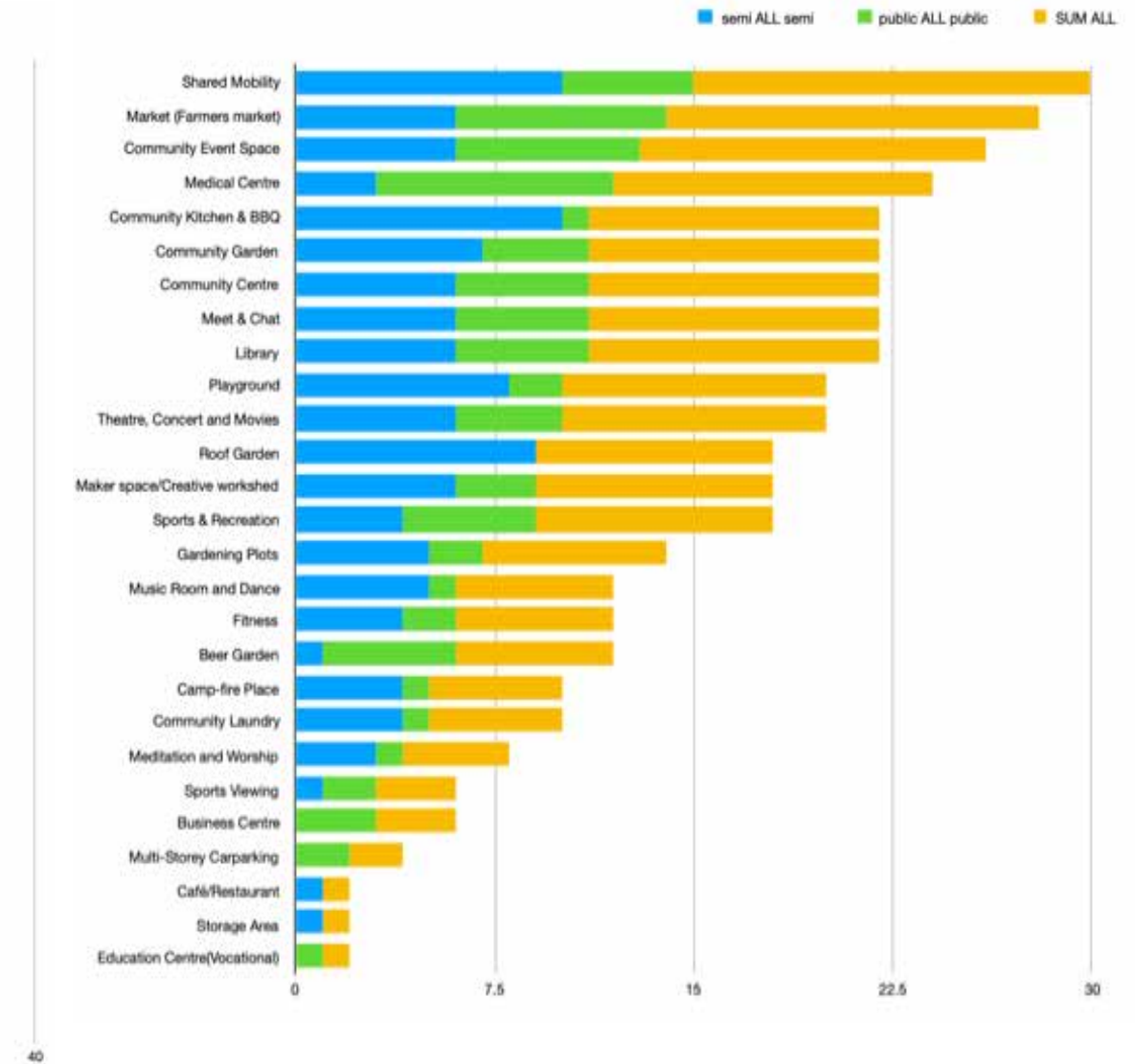


Figure 5 - Co-living game results (features). Source: author.

What shared features are preferred? (Fig. 5).

Where and When are people interested in sharing and negotiating semi-public and public domain and other general observations came up in discussions during the game set up period:

- Seniors groups don't think of thimbles as too old and think of a later stage when they are old;
- Like the idea of a collective (e.g. a church) buying ground to open a cooperative living environment;
- Want to stay in community;
- Are often socially isolated and hence like idea of supportive community;
- Sacred spaces for worshipping/mediation come up often;
- Need for a variety of different spaces to socialise but also to individually retreat;
- Slowing down;
- Playgrounds as social connectors;
- Inclusive and accessible spaces wanted;



- Awareness for raging in place models e.g. sharing for caring households;
- The simulation setting was often understood of the real life report instead of creatively scenic playing abstraction;
- The understanding of size of 'community' ranges.

### Discussion

As a result, meta themes emerged from the aggregated data of the game sessions. While each meta-theme is a cluster of individual accounts, taken together these accounts represent statements reflecting a similar set of insights, learnings or data points. In summary, occurring meta themes for inclusive co-living relate to place (purpose, encounter and diversity), governance (regulate, maintain, operate), community, and shared mobilityP

### PLACES:

- Places of Purpose: Places of purpose are those places and spaces where residents/ community members meet purposefully. These communal "features/spaces" within the co-housing community, were needed to bring people together, places where people "do things together": either physical activity or food related activities, gardening, film room/screenings, informal market space or swap areas where "people leave something and pick up something". In the words of one participant "I like to meet new people" "do something together" said one participant. Some examples of purposeful places provided by game participants are recreational centres, community hubs, 'community areas' for people to chat and meet; 'green areas'; market places;

- Places of Encounter: Places of encounter are spaces where interactions amongst 'strangers' are possible. During the course of playing the game, areas were mentioned by participants in the form of places, opportunities or qualities. Opportunities that these places of encounter offered were "to foster a 'sense of community", areas at which such encounters could occur may be in the form of a community hub that could be shared with the broader community. Such places of encounter would allow residents to step out of their private spaces to shared space for incidental interaction and 'chats' thereby overcoming social isolation, these would be welcoming places: "want everyone to feel welcome." Places of encounter were sometimes mentioned as being specific: a "Public area" a multipurpose space, to play music and relax"; a community kitchen where people could share meals with visiting family members, a 'space for the family to get together'; campfire spaces that "bring people together away from the TV".

- Places of diversity: In every session diversity of community was noted. This was in the form of age, culture and ability. Participants noted that communities that were intergenerational provided opportunities for meaningful and mutually beneficial social interaction with people of different ages/demographics, abilities and cultures Contact with children, places to practice and share skills with younger people, a market place where such craft can be sold or shared were important means towards intergenerational interactions.

• GOVERNANCE: The organisation of shared living, sharing amenities and spaces was discussed in all sessions. Spaces that were considered as possible for sharing were kitchens, storage paces, laundries, gardens and mobility (cars, vans..). That shared spaces require policies, procedures, management, coordination a communication structure and complaints mechanisms was noted in all the sessions. The need for community members to be willing to be involved and take responsibility was mentioned:

"some might volunteer time and skills, some people might just pay tax... "but you have to police it". The role of "shame and exposure as a tool for social cohesion" was mentioned.

• SHARED MOBILITY/ACCESSIBILITY: In a number of the games shared mobility, at first sight, was looked at quizzically. As a group of players began discussions, often their views on this amenity shifted. As Shared mobility, initially not considered relevant to the group, was then reconsidered as one of the top 3 features as the group recognised the need to address future needs of players, providing accessible transport which would serve all members.

• OPPORTUNITIES: Prior knowledge/experience: Several games began with "where I live now" this being the reference point from where participants began to create new imaginations. During the game many participants recounted what they thought of as exciting projects/experiences/ places.

• COMMONALITIES: All Players: were surprised by how much they all had in common when it came to deciding the features they wanted within their created community; In several games, participants made adjustments and were willing to decisions based on shared values for the community; While players clearly distinguished between public/ private realm, all players were willing to consider sharing but still valued privacy; An understanding that 'good' communal spaces = less 'living space' required in individual dwelling

• TRUST was an important factor in sharing spaces and activities.All Players: were surprised by how much they all had in common when it came to deciding the features they wanted within their created community; - In several games, participants made adjustments and were willing to decisions based on shared values for the community; - While players clearly distinguished between public/private realm, all players were willing to consider sharing but still valued privacy - An understanding that 'good' communal spaces = less 'living space' required in individual dwelling

• CONSTRAINTS: Some constraints that were noted by participants were related to their current living arrangements:

- Brought up isolation;

- Minimal interaction with neighbours attributed to cultural differences and living arrangements, single dwellings, large lot sizes and limited proximity/reasons to interact with neighbours;

- Reluctance to sharing what they viewed to be private spaces such as laundries and kitchens;

- The age variation amongst participants was reflected in the ways in which participants wanted to share amenities.

Essential guiding principles, programming and design characteristics have been further developed into a design proposal of the Co+3 'H+ Co-living dwelling complex' project within various urban scenarios in Perth Metropolitan region, Western Australia. A subsequent design framework (Co+1 Design Tool-Kit) recommends overall design principles for buildings without limitations in association with health and well-being.

## Trans-clusion<sup>4</sup>

This study has successfully brought together a multitude of different potential user groups for co-housing models. The gasified approach and at the same time the abstraction of the space usage over time in conjunction to desired ambience atmospheres has to lead to a substantial brief and concept for the subsequent further architectural development of such co-living environments.

Furthermore, after the presentation of this paper at the INTA conference, interest has been issued to continue this gamified method for this co-living approach in Brazil. The potential results will reveal an internal comparison of desires toward what people are ready to share with a compound community, what daily activities could happen in private and in public, what ambience descriptions are preferred, and finally where and when are people interested in sharing and negotiating semi-public and public domain. All those results will ever more inform design, planning and operation decisions to enable life-enhancing built environments in age-appropriate, inclusive and universal design, multi-generational, and co-living buildings without limitations.

While writing this article, a virus pandemic is affecting the globalised world as we know her and is transforming her right now into an unknown state. Henry Kissinger (2020) reminds us: The pandemic has prompted an anachronism, a revival of the walled city in an age when prosperity depends on global trade and movement of people. The world's democracies need to defend and sustain their Enlightenment values.

Evermore an expanded stakeholder approach for pre-design, planning and constant feedback all-through an evolutionary eco-systematic approach can improve and maintain a resilient system. Social-Guided self-governance (inter pares), governmental subsidies for cooperative schemes (not-for-profit) and policies around funding /tax deduction schemes are tools to achieve and to support self-initiated) housing cooperatives

This Co-living approach maps out the proof that the 'Civic involvement' (participation, engagement) is not only possible but leads to societal and caring ownership of housing and the community. Concoctions of soft instruments of the public hand's governance could enable bottom cooperative ownership models. In combination with participatory planning and design initiatives, long term strategies for ageing populations within diverse urban eco-systems should be integrated into other Urban Development Strategies such as: 'Climate protection' (energy efficiency); 'The city must be beautiful' (development culture); 'Good city governance' (good governance).

Ultimately, it's about getting rid of old ideas, daring experiments and, above all, realising them to find out what a contemporary urban mix that does justice to the unique diversity of people's life plans could look like. Only through a holistic networked approach catering for the diverse interplays of generations socio-economic groups and programmatic usages of the urban environment can lead into successful, safe and sustainable co-living buildings and livelihoods without limitations.

In the long term, cities can only fulfill their function as carriers of social progress and economic growth in the sense of the Lisbon strategy if they succeed in maintaining the social balance within and between the cities, enabling their cultural diversity and a high level of design, architecture and architecture to create environmental quality (EUROPEAN COMMISSION, 2007).

<sup>4</sup> Trans- (Latin prefix for across; beyond) -clusion (Latin claudere 'to shut').

## Acknowledgements

The author wants to thank the team of Housing/ Department of Communities/ Government of Western Australia for their trust, support and openness towards this research.

And the team around AUDRC for great collaborations.

## References

- Australian Bureau of Statistics, Australian Government (2012). 3222.0. *Population projections, Australia, 2012 (base) to 2101*. <https://www.abs.gov.au>
- Australian Institute of Health and Welfare (2018). *Older Australia at a glance*. <https://www.aihw.gov.au/reports/older-people/older-australia-at-a-glance/contents/demographics-of-older-australians/australia-s-changing-age-and-gender-profile>
- Cobb, S. (1976). *Social support as a moderator of life stress*. Psychosomatic Medicine, 38, 300-14.
- European Commission (2007). *LEIPZIG CHARTER on Sustainable European Cities*. [https://ec.europa.eu/regional\\_policy/archive/themes/urban/leipzig\\_charter.pdf](https://ec.europa.eu/regional_policy/archive/themes/urban/leipzig_charter.pdf)
- Facer, K., & Pahl, K. (2017). *Valuing Interdisciplinary Collaborative Research: Beyond Impact*. Policy Press
- Francis, J., Martin, K., Wood, L., & Foster, S. (2017). *I'll be driving you to school for the rest of your life: A qualitative study of parents' fear of stranger danger*. Journal of Environmental Psychology, 53, 112 – 120.
- Given, L.M. (2008). *Qualitative research methods*. Sage Publications
- Holt-Lunstad, J., Smith, T.B., & Layton, B.J. (2010). *Social relationships and mortality risk: A meta-analytic Review*. PLoS Medicine, 7, 7.
- Housing Authority (2019). <https://www.housing.wa.gov.au/aboutus/affordablehousingactionplan/affordablehousingstrategy/Documents/Ageing-with-Choice.pdf>
- Kissinger, H. A. (2020). *Opinion | The coronavirus pandemic will forever alter the world order*. WSJ. <https://www.wsj.com/articles/the-coronavirus-pandemic-will-forever-alter-the-world-order-11585953005>
- Ong, R., Wood, G., Cigdem-Bayram, M. and Salazar, S. (2019). *Mortgage stress and precarious home ownership: implications for older Australians*. AHURI Final Report No. 319, Australian Housing and Urban Research Institute Limited, Melbourne, <https://www.ahuri.edu.au/research/final-reports/319>, doi:10.18408/ahuri-8118901
- Ottmann, D. A. (2016). *Urban Correlator: Strategies for an ecologically adaptable urban and architectural development*. SVH publishers, Saarbruecken, 2016
- Ottmann, D. A. (2016). *Housing + C (Final report)*. Australian Urban Design Research Centre, Perth. ISBN 978-0-9942698-5-0

Ottmann, D. A. (2015). *Housing + (Final report)*. Australian Urban Design Research Centre, Perth. ISBN 978-0-9942698-4-3

Rosenstock, I.M. (2005). *Why people use health services*. Milbank Quarterly, 83,4.

Sanoff, H. (2016). *Design Games: Playing for Keeps with Personal and Environmental Design Decisions*. CreateSpace Independent Publishing Platform.